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TRANSACTION COSTS AND MARKET INSTITUTIONS: GRAIN BROKERS IN ETHIOPIA

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ABSTRACT

This paper examines the effect of transaction costs of search on the institution of grain brokers in Ethiopia. Primary data are used to derive traders' shadow opportunity costs of labor and of capital from *IV* estimation of net profits. A two-step Tobit model is used in which traders first choose where to trade and then choose whether to use a broker to search on their behalf. The results confirm traders' individual rationality in choosing brokerage, showing high transaction costs are linked to increased broker use while high social capital reduces broker use.

1. INTRODUCTION

Transaction costs arise in the course of market exchange and involve the costs of information, search, negotiation, screening, monitoring, coordination, and enforcement.[1] Transaction costs vary by individual, leading to heterogeneous market behavior (Bardhan,1989; Sadoulet and de Janvry, 1995). The specificity of transaction costs to individual agents implies that these costs are endogenous to the behavior of market participants and are thus unobservable at the market level. Individual efforts to minimize transaction costs lead to the emergence of alternative institutional arrangements. The link between transaction costs and the emergence of institutions has long been recognized in institutional economics theory (Alchian and Demsetz, 1972; Coase, 1937; Hoff and Stiglitz, 1990; North, 1990; Williamson, 1985). However, the inherent difficulty of measuring transaction costs at the level of market agents has limited empirical studies of whether particular institutions indeed effectively minimize transaction costs. Yet, empirical analysis is particularly warranted in contexts in which agents operate in a weak market environment and where transaction costs are presumed to be

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[1] Transaction costs are defined here as costs related exclusively to the coordination of exchange among market actors, distinct from the physical costs of transferring goods, such as transport, handling, and storage costs.

very high, such as the recently liberalized agricultural markets of sub-Saharan Africa and other economies in transition.

In spite of the extensive literature on the functioning of agricultural markets in less-developed countries,[2] very few studies have addressed the effect of transaction costs on market institutions (Bryceson, 1993; Harriss-White, 1996; Barrett, 1997). While this omission is due in part to the lack of adequate data on transaction costs, it is also rooted in the assumption that prices are linearly related, supporting the neoclassical hypothesis that there are no agent-specific transaction costs and that transfer costs are fixed across time and across agents.[3]

In the context of the Ethiopian grain market, this paper addresses the transaction costs related to searching for a buyer or a seller, a central aspect of the exchange process. Search is costly, both in terms of labor costs for search activities and the time cost of holding inventory during the search period. The paper has two objectives. First, the paper aims to overcome the endogeneity bias of quantitatively measuring transaction costs by imputing the shadow opportunity costs of search labor and of capital held during search from individual

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[2] See Jones, 1996 for a review of this literature.

[3] This assumption has been shown to result in significant upward bias in the measurement of market integration (Baulch 1994). Further, it is recognized that interpretation of results of price-based models is problematic without additional information on institutional marketing arrangements (Palaskas and Harriss-White, 1993; Dercon, 1995).

traders' profit functions, using a rich set of instruments for access to labor and capital. Second, the paper focuses on a particular market institution in the Ethiopian market, grain brokers, and tests empirically the hypothesis that market agents are individually rational in using the services of brokers to minimize their transaction costs of search. The study of the brokerage institution in Ethiopia is particularly interesting because grain wholesalers are not obligated to use brokers for any or all of their transactions, thus enabling an empirical test of the determinants of their choice to use brokers. Thus, while 85% of the sampled traders in Ethiopia indicated using brokers regularly, they used brokers for 30% of their total transactions, on average, suggesting that they chose whether or not to use brokers on a per transaction basis. At the market level, in a context where market participants can choose whether or not to use brokers, rational use of brokers by individual agents implies that this institution enhances global market efficiency by promoting a more efficient allocation of search effort.

Generally, brokers play an important role in most markets in which buyers and sellers are unknown to each other, whether these markets are highly sophisticated, organized exchanges such as the Chicago Board of Trade (Cronon, 1991), or periodic markets with extremely limited infrastructure, such as agricultural markets throughout the developing world (Gilbert, 1969; Lele, 1971; Jones, 1972; Scott, 1985; Hayami and Kawagoe, 1993). Brokers have rarely been studied despite their critical function in the exchange of goods. Where the

role of intermediaries has been analyzed, in the financial and real estate literatures, the link between transaction costs and the emergence of intermediaries as a mechanism to reduce costs is not drawn (Townsend, 1978; Rubenstein and Wolinsky, 1987, Yavas, 1994, Aitken et al, 1995; Cosimano, 1996).

The Ethiopian grain market, like many agricultural markets in the developing world, operates in a constrained environment lacking a system of public information transmission, grain standardization and certification services, efficient and accessible telecommunications and transport, and effective legal mechanisms to enforce contracts (Gebre-Meskel, 1996; Negassa, 1998). A particular feature of the Ethiopian grain market is that the pattern of grain trade follows a radial structure with grain flowing into a single central market from outlying surplus production areas and flowing out from the central market to deficit areas in other regions of the country (Lirenso, 1996). This radial structure implies that the majority of grain traded in the country is exchanged in the central market, crosses relatively long distances, and is traded between agents who otherwise have no contact.

In Ethiopia, brokers play a pivotal role in the transfer of grains from surplus regions to deficit regions. There are approximately 40 established grain brokers located in Addis Ababa, the central market, relative to a total of 2,500 grain

wholesalers (Lirenso, 1993; Amha, 1994). Brokers do not trade on their own account and fulfill a purely intermediary role of matching buyers and sellers, located in distant regional markets. In return, brokers receive a commission that is a fixed fee per quantity traded.[4]

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[4] The agency relations and incentive mechanisms of brokers in this market is presented in Gabre-Madhin (1998).

2.   DATA DESCRIPTION

This study uses primary data collected in Ethiopia in 1996 on 152 wholesale grain traders and 17 grain brokers in 12 markets in seven regions. The study regions were selected on the basis of their representation by type of grain, geographical distribution and importance to national grain flows. The study regions comprised three surplus regions, Wollega region (Nekempte and Jaji markets), Arsi region (Assela and Sagure markets), and Gojjam region (Bahr Dar and Bure markets) and three deficit regions, Wollo (Dessie and Kombolcha markets), Tigray (Mekele market), and Hararghe (Dire Dawa and Harar), in addition to the central market of Addis Ababa. Trader and broker surveys were carried out in two rounds in 1996. In each market, the maximum number of traders were sampled, from a random selection of existing traders in the market. Given the unavailability of a reliable census of traders from official sources, this method was considered to be the least-biased alternative.

With respect to search labor, information was collected on the minutes spent daily gathering market information, traders consulted daily, person-days required to conduct a transaction, offers considered prior to completing a transaction, employees engaged in search, and traders' access to additional labor, such as

the number of family members available and the traders' other occupations. With respect to the cost of capital, information was collected on the amount of working capital held by traders, the frequency of turnover of capital, and the sources and amount of credit obtained (bank, friends, family, supplier, savings association). Additional information on traders' access to additional capital was collected on the number of possible creditors, parents in grain business, ownership of collateral assets, and inheritance. Data on social capital, or the extent of "connectedness" that traders had, were obtained through questions regarding the number of local and distant market contacts, the number of contacts from the same region, the number of family and friends in grain trade, the number of regular partners traders had in local and distant markets, and the number of languages spoken. Finally, traders were asked to detail what proportion of local and distant transactions occurred with intermediaries, for purchases and sales separately.

3.   ESTIMATION OF TRANSACTION COSTS OF MARKET SEARCH

Each trader faces a unique set of transaction costs related to his or her costs of finding a buyer or seller with whom to exchange. The trader invests labor time in the search process and, because search is time-consuming, bears the opportunity cost of the labor time spent in search. Second, the trader bears the opportunity cost of tying up his or her working capital in the form of grain stocks while the search is under way.

Using directly observed search labor and working capital to explain traders' use of brokerage would result in endogeneity bias since the actual levels of search labor and working capital chosen by traders are not independent of their choice of brokerage.   In order to avoid this bias, the opportunity costs of the traders' search time and working capital are derived as shadow costs from each trader's profit function. After controlling for physical marketing costs, such as transport, handling, and storage, each trader maximizes revenue subject to his or her costs of the labor time invested in search and the opportunity cost of holding grain inventory during the search period.   Each trader is endowed with a unique distribution of trading contacts that directly influences his or her ability to find a trading partner. This distribution, or network, is considered a parameter of the

trader's social capital and acts as a positive shifter in the trader's revenue function. The trader's revenue maximization is expressed by

$$(1) \quad \mathscr{L} \ = \ \gamma L^{\alpha} K^{\beta} e^{\varepsilon} \ - \omega L - vK$$

where γ is social capital, ω is the opportunity cost of search labor (L), and v is the opportunity cost of working capital (K). From the first-order conditions for profit maximization, the shadow opportunity costs of search labor ω^{*} and of working capital v^{*} are derived as

$$(2) \quad \omega^{*} = \frac{\alpha R}{L}$$

$$(3) \quad v^{*} = \frac{\beta R}{K}$$

Ordinary least squares estimation of the trader's revenue function would result in asymptotically biased estimators because of the simultaneity bias that exists because both search labor and working capital depend on revenue and thus will not be independent of the model's error term.[5] To overcome this bias, two-stage least squares estimation is used to obtain the coefficients necessary for deriving ω^{*} and v^{*}. A rich set of instruments for search labor and working capital are

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[5] This issue generally plagues the estimation of production functions, to which a solution is to apply duality theory, a solution which fails to use all available information and is statistically inefficient (Mundlak, 1996). In this case, the existence of a rich set of instruments provides a more convincing instrumental variables estimator.

obtained from the data, chosen on the basis of their impact on search labor and working capital without directly influencing revenue. Instruments used for search labor are access to additional persons to help in search, the number of languages spoken by the trader, the trader's age, and whether the trader has another business. Instruments for working capital are access to a bank loan, access to credit from friends and family, collateral assets such as a home or a car, inheritance of family business, and other family members in business.

Table 1 presents the results of the instrumental variable estimation of trader revenue, used to derive the opportunity costs of labor and capital for individual traders. The estimation uses two alternative specifications of trader revenue. Net revenue, the net margin (after accounting for physical marketing costs) multiplied by the quantity of sales is used in the first estimation. The gross value of sales is used in the second estimation. Search labor is measured by the number of persons in the trading firm who are engaged in search for buyers and sellers. Working capital is measured by the average amount of funds that the trader has at his or her disposal for the purpose of buying and transacting grain. Social capital is measured by the number of persons in the grain trade business whom the trader knows personally. Search labor, working capital, and social capital have positive coefficients, as expected, and are significant in both model estimations. The Wald test of the assumption of homogeneity reveals that the null hypothesis that revenue is homogenous of degree 1 in search labor and

working capital holds at the 13% confidence level.[6] The α and β coefficients generated from the two-stage least squares estimation are used to derive the shadow opportunity cost of labor (ω^*) and the shadow opportunity cost of capital (v^*) for each individual trader.

The distribution of the estimated opportunity costs of search labor (ω^*) and of working capital (v^*) across traders are shown in Figures 1 and 2. The opportunity costs of search labor are relatively low for the majority of the sample (Figure 1). Thus, nearly 60% of traders have shadow opportunity labor costs less than 40 Ethiopian Birr daily (equivalent to US$ 6.00 in 1996). Although this shadow wage is significantly higher than the national income per capita per day,[7] this result suggests that traders are not time-constrained relative to existing market opportunities. Conversely, there are limited opportunities for the majority of traders to increase revenue through alternative uses of their labor time. In contrast, the opportunity cost of capital is normally distributed across the sample population (Figure 2), with an average annual interest rate of 15%, which is significantly higher than the official bank interest rate of 10% in 1996 (National Bank of Ethiopia). The higher variability of shadow costs of capital suggests that capital constraints may be more binding in terms of traders' market behavior, with

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[6] Tests for functional form specification were carried with alternative specifications, such as translog and CES, were carried out.
[7] The average annual per capita income in Ethiopia was $110.00, or Birr 700.00, in 1996 (World Bank).

a greater number of traders likely to opt for opportunities to reduce these costs. In sum, the distribution of both types of transaction costs across traders demonstrates the heterogeneity of individual market actors and allow the testing of the impact of these costs on the use of the brokerage institution in the Ethiopian grain market, addressed below.

4.   TRADERS' SEQUENTIAL CHOICE AND USE OF BROKERS

In constrained market environments, long-distance trade involves high coordination costs and considerable risk.   Each trader is faced with the choice of incurring higher search costs by trading in a distant market or trading locally, in a familiar market, where search costs are relatively low but opportunities are limited.   In Ethiopia, grain wholesalers in regional market centers, located 300 to 500 kilometers from the central market, can either transact locally in their own market towns or trade in the distant central market.   This choice is partly determined by the type of region in which traders are based.   Wholesalers located in surplus production regions tend to purchase grain locally from smaller traders and farmers and sell this grain in the distant central market.   Wholesalers located in the deficit regions tend to procure grain from the central market and to sell it locally to retailers and consumers (Table 2).   Because long-distance transactions entail higher search costs and are enhanced by larger endowments of social capital, the choice to trade in a distant market is endogenous to each trader's unique search costs and social capital. A trader's share of long-distance transactions depends on his or her opportunity costs of search labor and of working capital, social capital, as well as market-level effects, such as the trader's location. The average share of long-distance purchases (P_{-i}) and sales

(S_{-i}) of other traders in the same market capture these effects. Thus, the trader's share of long-distance trade in total transactions is represented as

(4) $D_{i,t}$ = $\alpha_0 + \alpha_1 \omega^* + \alpha_2\ v^* + \alpha_3\ \gamma + \alpha_4\ P_{-i} + \alpha_5\ S_{-i} + u_1$

$D_{i,t}$ = 0   *otherwise*

Traders who have chosen to trade long-distance in the central market are faced with a second choice, in the presence of brokers. Each trader evaluates the expected gains from searching directly without a broker with the expected gains from using a broker. A trader's net profit from searching directly is a function of his or her individual transaction costs of search, social capital, and the time he or she requires to find a buyer or seller in the distant market (τ). A general form for a trader's net profit function from direct search is $\Pi_i^d = \Pi(\gamma_i, \omega_i, v_i, \tau_i)$. When a trader uses a broker, his or her net profit no longer depends on the trader's opportunity cost of search labor, social capital, or time that he or she requires to find a buyer or seller. Instead, the trader's net profit from using a broker is a function of the broker's social capital (γ^b), the broker's commission (*k)*, the trader's opportunity cost of tying up his or her working capital, and the time required for the broker, rather than the trader, to complete the search (τ^b). A general form for a trader's net profit from using a broker is $\Pi_i^b = \Pi(\gamma^b, k, v_i, \tau^b)$.

A trader's participation constraint for using a broker is that net gains are higher with a broker than with direct search, such that $\Pi_i^b \geq \Pi_i^d$. If the broker is more efficient in search than the trader, $\gamma^b > \gamma_i$ and $\tau^b < \tau_i$. In this case, the difference between profits from using a broker and from searching directly, $\Pi_i^b - \Pi_i^d$, increases in the trader's opportunity cost of search labor and of working capital and decreases in social capital. Because search costs are higher for long-distance transactions, a trader's use of brokerage increases with the share of long-distance trade (Table 2). Thus, the trader's share of brokered trade in total transactions (B) depends on his or own transaction costs of search, social capital, regional effects (G), as well as the predicted share of long-distance trade ($\hat{D}_{i,t}$) :

(5) $B_{i,t} \quad = \quad \beta_0 + \beta_1 \omega^* + \beta_2 v^* + \beta_3 \gamma + \beta_4 \sum \hat{D}_{i,t} + \beta_5 \sum G + u_2$

$B_{i,t} \quad = \quad 0 \quad\quad otherwise$

A recursive approach is used to represent participation in brokerage as a function of participation in long-distance trade, which itself is influenced by social capital and the transaction costs of search and social capital. Recursive econometric models have been used to explain gift exchange (Ravallion and Dearden, 1988) and technology adoption (Kumar, 1994, Zeller et al, 1996). A two-step Tobit estimation avoids the inconsistent estimates of brokerage use due to the simultaneity bias that arises because trader-specific variables will influence both

the use of brokers and the share of long-distance trade.[8]   In the first step, predicted shares of long-distance trade (D) are obtained from the Tobit estimation of Equation 4.   In the second step, predicted shares of long-distance trade ($\hat{D}$) are used to estimates the shares of brokerage use (B).[9]   The use of censored regression, rather than least squares, is justified by the existence of a significant proportion of traders with zero shares of long-distance trade and of brokerage. Ordinary least squares would result in upward biased estimators due to the selectivity bias that results from only including non-zero observations in the analysis (Greene).   The expected marginal effects of the opportunity costs of search and capital and of long-distance trade on the use of brokers are positive, while the expected effect of social capital is negative, thus, $\dfrac{\partial B}{\partial \omega} > 0$, $\dfrac{\partial B}{\partial v} > 0$,

$\dfrac{\partial B}{\partial D} > 0$, and $\dfrac{\partial B}{\partial \gamma} < 0$.

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[8] A similar specification is used by Ravallion and Dearden (1988) to model transfer receipts and outlays, in which predicted consumption is used as a proxy for the regressand, post-transfer permanent income.

[9]   Using predicted, rather than actual, shares from the first Tobit estimation results in inconsistent standard errors. This can be corrected with a maximum likelihood estimation.

5. ESTIMATION RESULTS FOR TRADERS' LONG-DISTANCE TRADE

(STEP 1)

Tobit estimations of the share of each trader's long-distance trade are based on

the shadow transaction costs obtained from both the net revenue and the gross

value of sales IV estimations in Table 1. Shares of long-distance trade are

estimated for purchases and sales separately, in order to control for the location

effect on long-distance trading behavior, noted earlier. Unconditional or Tobit

elasticities adjust the estimated coefficients by accounting for both the effect on

the conditional mean of the dependent variable in the positive part of the

distribution and the effect on the probability that the observation will fall in the

positive part of the distribution (McDonald and Moffitt).[10] Tobit elasticities are

obtained by adjusting the coefficients by the Φ proportion of the sample that has

zero observations of the dependent variable. In effect, this adjustment lowers the

marginal effect by the probability that traders with zero distant transactions would

engage in some amount of distant transactions as a result of marginal changes in

the regressors. In both model specifications, transaction costs have a large and

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[10] McDonald and Moffitt (1980) suggest a decomposition of the slope vector into: $\partial E[y_i|x_i] /\partial x_i =$ $Prob[y_i^* >0] \partial E[y_i^*|x_i, y_i^*>0]/\partial x_i + E[y_i^*|x_i, y_i^*>0] \partial Prob[y_i^* >0]/ \partial x_i$. The unconditional elasticity is obtained by scaling the parameters of the Tobit regression by the probability in the uncensored part of the distribution. See also Greene (1993) for examples and Ravallion and Dearden (1988) for an application of this method.

significant effect on long-distance trade for purchases and sales (Table 3). Similarly, social capital also has a significant, though smaller, impact on distant trade, with the exception of distant purchases in the second set of estimations. In contrast, market-level effects are relatively small and highly significant in the case of the same type of transaction, either purchase or sale. It is difficult to interpret the signs of the transaction cost and social capital coefficients, which appear inverted, because of the endogeneity between transaction costs, long-distance trade, and use of brokers.

7.	ESTIMATION RESULTS FOR TRADERS' USE OF BROKERS (STEP 2)

In the second step, the share of brokered transactions is estimated with Tobit for both model specifications and for purchases and sales separately (Table 4).   In order to control for the effects of local use of brokers (that is, within regional market centers), the share of brokered transactions is restricted to brokers used for long-distance trade. The set of explanatory variables used includes regional dummy variables to capture the effects of regional effects. In a simultaneous system of Tobit equations, where predicted values of long-distance trade are used as a regressor, standard errors of the estimated coefficients will be inconsistent.   To correct for this, standard errors are estimated through bootstrapping with 1,000 replications, a procedure that provides generally very good estimates.[11]

Traders' use of brokers is individually rational in that higher transaction costs lead to increased use of brokers while higher social capital reduces the use of brokers, suggesting that the presence of brokers enables traders to minimize

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[11] This procedure involves random drawing, with replacement, N observations from the dataset, and estimating the statistics for each replication. From the dataset of estimated statistics, one can estimate the standard error of the statistic. However, the point estimate used in the orginal observed statistic θ_{obs} rather than the average $\bar{\theta}^*$ from the replications (Mooney and Duval, 1993).

their transaction costs and trade more efficiently.[12] In both model specifications, results are more robust for distant purchases than for sales. This may be explained by the fact that purchasing involves more transaction costs than sales in that buyers must ensure that the quality and the quantity of the contracted grain will conform to their expectations and that delivery will occur, in the appropriate time. In the net revenue specification (Model 1), the opportunity cost of labor spent in search has a larger effect than the opportunity cost of capital or social capital on the use of brokers. The high likelihood of receiving inferior grain or being quoted an incorrect price leads many traders to go directly to the central market to conduct purchases. Traveling to the central market, located between up to 700 kilometers away, requires leaving a responsible manager at the trader's stall.   Traders who are unable to do this and who are active traders thus have a very high opportunity cost of labor and are likely to use brokers for distant purchases. Transaction costs seem to matter less in the case of sales, perhaps because traders are not concerned with being cheated on the quality of the grain. Typically, traders who ship grain to the central market must wait until the sale is completed and they have received their payments before purchasing new stocks of grain. Highly impatient traders, who seek to turn their capital around as quickly as possible, are thus more likely to engage the services of a broker and minimize on the time that their working capital is tied up in grain stocks. In the

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[12]   A welfare simulation of the economic efficiency gains from brokerage is addressed in Gabre-Madhin (1998).

second model specification, the opportunity cost of capital has a larger effect on traders' use of brokers, although the magnitudes of the effect of both costs and of social capital are lower than in the first model.

Somewhat surprisingly, predicted shares of long-distance trade do not appear to have a significant impact on the use of brokers and their effects are relatively minor relative to other explanatory variables even where significant, in the case of purchases in the second model.   Finally, the region in which traders are located appears to have a very large and significant effect on the use of brokers, particularly in the case of Wollega, Arsi, and Gojjam, the three surplus producer regions.

8.   CONCLUSIONS AND POLICY IMPLICATIONS

Despite the recent focus on the importance of markets for economic growth, very little is known about how transaction costs influence the emergence of market institutions.   Even less is known about the nature and extent of these transaction costs, which are generally assumed to be fixed across market participants. Contrary to standard assumptions, individually varying transaction costs imply that economic agents are not interchangeable in terms of their behavior in the market. An important gap in understanding how markets work is the process and costs incurred by each market participant in searching for a trading partner and the role played by intermediaries in facilitating market search.   This study addressed this gap by measuring the extent of trader-specific transaction costs of search and by investigating the impact of these costs on traders' use of the institution of brokerage.

The study revealed that the costs associated with searching for a trading partner vary significantly across traders, according to *where* traders operate, the *type* of transaction they are conducting, and their individual characteristics. A unique data set on Ethiopian grain traders' individual search efforts, access to capital,

trading networks, along with a rich set of instruments, enabled the analysis of the effects of these costs on trading arrangements made by individual traders.

An empirical model linking individual traders' transaction costs and use of brokers was constructed to test whether traders were individually rational in choosing to use brokers in order to minimize their transaction costs of search. In testing this model, sample selectivity bias was avoided through the inclusion of non-users of brokerage and simultaneity bias, due to the fact that the location of trade is linked to the choice of brokerage, was avoided by using predicted shares of distant transactions from a regression of distant shares against traders' transaction costs, social capital, and market-level effects.

The results reveal that, despite traders' heterogeneity, their individual behavior vis-à-vis the presence of brokers is economically efficient. This finding suggests that traders operating in newly liberalized markets are "efficient-but-poor," to paraphrase Schultz' classic hypothesis, in that they operate within highly constrained, risky, and costly marketing environments. Thus, while traders exhibit optimizing behavior, they are nonetheless clearly acting in a second-best world. The results imply that the function of brokers is critical in reducing transaction costs and enhancing the performance of the Ethiopian grain market. In addressing the key question of how best to strengthen the performance of the private sector in the post-market reform era, this study supports the view that

policy must have a clear understanding of the transaction costs faced by traders and their impact on the microeconomic behavior of traders. This study highlights that efforts to improve the overall efficiency of the Ethiopian grain market must be aimed at increasing the efficiency of the search function provided by brokers and at formalizing and strengthening their specialized role in the market, which will particularly benefit those traders with the highest transaction costs of search.

Table 1.   Instrumental Variables Estimation of Transaction Revenue

Variable	Variable Name	(1) Net Revenue			(2) Gross Value of Sales		
		Coefficient	Std. Error		Coefficient	Std. Error	
Intercept	_CONS	1.87	3.82		1.99	3.38	
Search labor	ln SLABOR	0.75	0.40	**	0.64	0.36	*
Working capital	ln WORKAP	0.56	0.39	*	0.88	0.34	***
Social capital	ln SOCKAP	0.34	0.13	***	0.23	0.11	**
Adj. R^2		0.28			0.22		
N		174			178		
Wald test (ρ) (H$_0$: $\alpha + \beta = 1$)		0.13			0.18		

Variable	Description of Variable	Mean	Standard deviation
Dependent			
ln REV	net trading revenue (Birr/season)	8.96	1.51
ln VSALES	gross value of sales (Birr/season)	7.16	1.29
Search Labor ln SLABOR	Number of employees engaged in search	0.72	0.36
Instruments:			
OTHRESP	=1 if trader has access to additional search	0.71	0.45
NLANG	Number of languages spoken by trader	1.89	0.80
OTHBUS	=1 if trader has another business	0.22	0.41
AGE	Age of trader	32.83	12.30
Working Capital ln WORKAP	Average working capital (Birr)	10.41	1.08
Instruments:			
POSSBANK	=1 if trader can access a bank loan	0.77	0.44
ACCESS	Number of persons trader could ask for loan	4.10	3.20
HOME	=1 if trader owns residence	0.57	0.49
CAR	=1 if trader owns car	0.08	0.27
INHERIT	=1 if trader inherited business	0.26	0.44
FAMBUS	=1 if trader has family in business	0.71	0.45
Social Capital ln SOCKAP	Number of trading contacts	2.26	0.83

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

Table 2.   Long-distance Trade and Use of Brokers by Type of Market[a]

Type of Market		Share of Distant Purchases (% of Total Purchases)	Share of Distant Sales (% of Total Sales)	Share of Distant Brokered Purchases (% of Total Distant Purchases)	Share of Distant Brokered Sales (% of Total Distant Sales)
Surplus	*Mean*	52.06	65.49	27.49	66.18
	Std. Dev.	36.53	34.50	36.63	37.69
	N	116	114	97	103
Deficit	*Mean*	64.73	8.25	48.45	37.22
	Std. Dev.	41.02	15.71	44.53	47.68
	N	97	97	80	27
Central	*Mean*	18.57	8.58	0.00	0.00
	Std. Dev.	35.14	22.44	0.00	0.00
	N	67	67	21	11
Total	*Mean*	48.44	31.80	33.04	55.47
	Std. Dev.	41.63	38.51	40.95	42.98
	N	280	278	198	141

[a] The statistics are compiled for two rounds of shares data.

Table 3.　　　Tobit Estimation of the Shares of Long - Distance Trade

Variable		(1) Net Revenue				(2) Value of Sales			
		Distant Purchases (% share)		Distant Sales (% share)		Distant Purchases (% share)		Distant Sales (% share)	
		Coef. S.E.	Tobit Elast.	Coef. S.E.	Tobit Elast.	Coef. S.E.	Tobit Elast.	Coef. S.E.	Tobit Elast.
Intercept	_cons	- *** 293.91 92.32		- *** 419.04 86.00		-255.54 *** 78.90		- *** 365.76 73.66	
Market Share Distant Purch.	$P_{j \neq i}$	0.72 *** 0.11	0.18	-0.45 ** 0.21	-0.18	1.50 *** 0.20	0.37	-0.36 ** 0.18	0.15
Market Share Distant Sales	$S_{j \neq i}$	-0.22 0.16	-0.06	0.78 *** 0.08	0.32	-0.24 0.17	-0.06	1.93 *** 0.17	0.79
Opp.Cost of Labor	$\ln \omega^*$	53.43 *** 19.60	13.36	75.02 *** 18.04	30.76	15.88 *** 5.76	4.00	26.13 *** 5.32	10.71
Opp. Cost of Capital	$\ln v^*$	48.99 ** 22.01	12.25	58.34 20.13 ***	23.92	45.68 ** 20.71	11.42	54.03 *** 18.94	22.15
Social Capital	$\ln \bar{Z}$	-23.91 * 14.69	6.00	-41.73 *** 13.58	17.11	-3.40 7.61	-0.85	-15.02 ** 7.06	6.16
Number of observations		200		200		200		200	
SEE								46.14	
Prob (T>0| $\bar{X}$) Predicted		0.33		0.52		0.31		0.40	
	Actual	0.25		0.41		0.25		0.41	

* Significance at 10%; ** Significance at 5%; *** Significance at 1%

Table 4.   Tobit Estimation of the Shares of Broker Use for Distant Trade

Variable		(1) Net Revenue				(2) Value of Sales			
		Distant Purchases (% share)		Distant Sales (% share)		Distant Purchases (% share)		Distant Sales (% share)	
		Coef. S.E^a.	Tobit Elast.	Coef. S.E^a	Tobit Elast.	Coef. S.E^a	Tobit Elast.	Coef. S.E^a	Tobit Elast.
Intercept	_cons	-2187.29 ***		-1113.92 *		-1914.33 ***		-966.14 ***	
		713.91		616.57		621.30		531.17	
Predicted Distant Purch.	D_{purch}	0.70	0.22	-0.36	0.21	0.71 *	0.23	-0.36	0.20
		0.53		0.60		0.56		0.55	
Predicted Distant Sales	D_{sale}	-5.84	-1.87	-1.37	-0.77	-5.87 **	-1.90	-1.37	-0.76
		1.80		1.20		1.90		1.09	
Opp.Cost of Labor	ln ω*	384.05 ***	122.90	205.83 *	115.26	132.67 ***	42.45	61.43 *	34.40
		148.76		120.38		51.97		38.14	
Opp. Cost of Capital	ln ν*	301.65 ***	96.53	188.06 *	105.31	279.46 ***	89.43	175.31 *	98.17
		127.31		107.40		124.64		100.09	
Social Capital	ln $\bar{Z}$	-231.82 ***	-74.18	-137.73 **	-77.13	-94.50 ***	-30.24	-58.85 **	-32.96
		85.91		74.44		35.34		30.87	
WOLLEGA		438.53 ***	140.33	265.73 ***	148.81	484.60 ***	155.07	351.68 ***	196.94
		151.80		104.34		135.14		120.72	
ARSI		676.64 ***	216.52	256.55 **	143.67	715.25 ***	228.88	366.89 ***	205.46
		224.41		113.47		191.95		143.74	
TIGRAY		108.79 ***	34.81	258.79 ***	144.92	104.74 ***	33.52	264.23 **	147.97
		38.58		66.65		37.59		67.14	
		136.25		82.36		136.08		111.70	
HARARGHE		-71.62 ***	-22.92	66.37	31.01	-64.59 **	-20.67	65.97	36.94
		39.44		52.59		38.55		51.93	
N		151		116		151		116	
SEE		85.75		80.59		94.81		80.80	
Prob (T>0| $\bar{X}$)									
Predicted		0.26		0.52		0.35		0.54	
	Actual	0.32		0.56		0.32		0.56	

^{a} Standard errors are estimated from bootstrapping with 1000 replications. * Significance at 10%; ** Significance at 5%; *** Significance at 1%
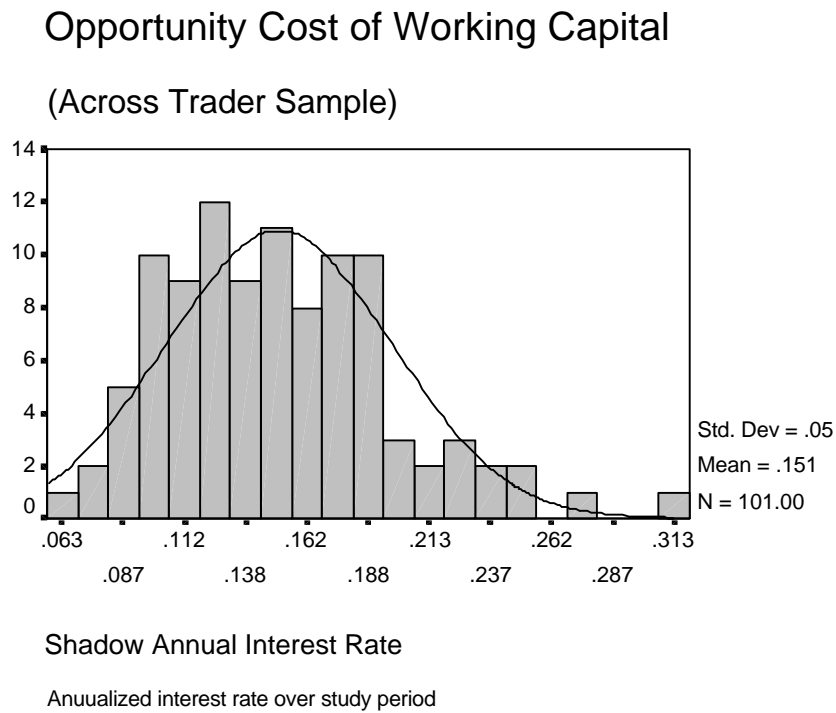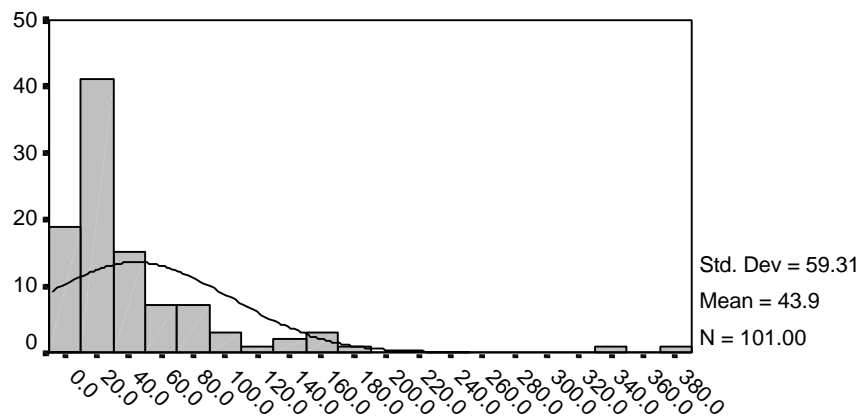
Figure 1.

Opportunity Cost of Working Capital

(Across Trader Sample)

Std. Dev = .05
Mean = .151
N = 101.00

Shadow Annual Interest Rate

Anuualized interest rate over study period

Figure 2.

Opportunity Cost of Search Labor

(Across Trader Sample)

Std. Dev = 59.31

Mean = 43.9

N = 101.00

Shadow Daily Wage Rate

Daily wage of incremental search labor

Ethiopian Birr: $1 = Birr 6.35

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